THE sixth annual students' soirée of the Sir John Cass Technical Institute will be held on Saturday, March 16. The programme includes special demonstrations and short addresses on scientific subjects in the laboratories and workshops of the institute.

ON April 23, the University of Glasgow will confer the honorary degree of Doctor of Laws upon Sir George Watt, author of the "Dictionary of the Economic Products of India"; Prof. E. Boutroux, Paris; Prof. J. Norman Collie, F.R.S.; Prof. U. Dini, Pisa; Prof. J. H. Poincaré, Paris; Prof. John G. McKendrick, F.R.S.; and Principal D. Macalister.

THE estimated expenditure on education, science and art, for the year ending March 31, 1908, is given in the Civil Service Estimates, recently issued, as 17,495,237*l.*, which is a net increase of 316,955*l.* upon the grants made in the fiscal year just ending. The following extracts show how some of the estimates compare with the grants made in the preceding year:—

	1907-8	Compared with 1906-7	
		Increase	Decrease
	£	£	
Board of Education ...	13,593,646 ...	254,046 ...	—
British Museum	171,041 ...	1,043 ...	—
Scientific Investigation, &c.	54,479 ...	— ...	3,171
Universities and Colleges, Great Britain, and Intermediate Education, Wales ...	201,400 ...	1,000 ...	—
Public Education (Scotland)	2,022,554 ...	50,426 ...	—
Public Education (Ireland)	1,408,360 ...	15,137 ...	—
Queen's Colleges (Ireland)	4,700 ...	— ...	161

The apparent decrease in the estimate under scientific investigation is explained by the fact that in 1906–7 the grant to the National Physical Laboratory for new buildings and equipment was 10,000*l.*, instead of the 5000*l.* to be granted to the laboratory in 1907–8.

THE executive committee has submitted to the trustees of the Carnegie trust for the universities of Scotland its sixth annual report, which is concerned with the administration of the trust during the year 1906. Under the scheme of allocation for five years of an annual grant of 40,000*l.* among the four Scottish universities, which became operative on January 1, 1903, sums of 37,289*l.* were claimed and paid during 1906. The grants for library purposes and for provisional assistance in teaching amounted for the year to 6400*l.* For buildings and permanent equipment the grants for 1906 reached 26,189*l.* Payments towards teaching endowments to the extent of 4700*l.* were made, and there is under this head an unexpended balance of 25,132*l.* Under the scheme of endowment of post-graduate study and research, appointments were made to seventeen fellowships and to thirty-seven scholarships. Grants of varying amounts were in addition paid to forty applicants. The total expenditure under this scheme was 6303*l.* during 1906, and it is estimated that during 1907 8064*l.* will be spent. The expenditure upon the Royal College of Physicians laboratory during the year was, so far as the trust is concerned, 314*l.*—this amount being independent of the capital invested in taking over the property of the laboratory buildings. The report directs attention to modifications in the scheme of payment of class fees adopted last year by the committee; the first limited payment of fees of further classes to those beneficiaries who had passed their graduation examinations up to date, and the second modification limited payment of fees of advanced classes to those who had proved their ability to profit by such classes. A striking diminution in the number of beneficiaries and in expenditure upon class fees followed the adoption of these modifications. The report is provided with extensive appendices, which supply detailed information concerning the numerous activities of the trust.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 13, 1906.—"The Velocity of the Negative Ions in Flames." By Ernest **Gold.** Communicated by Prof. H. A. Wilson, F.R.S.

The experiments described in this paper may be regarded as a continuation of the investigations of the properties of ions in flames carried out by Prof. H. A. Wilson in this country and by Marx and Moreau on the Continent.

The determinations of the velocity of the negative ions previously made had led to the conclusion that the ions were of the nature of corpuscles loaded with electrically neutral molecules. The present series of experiments shows that this is not the case, but that the ions are probably free electrons.

The first part of the paper gives an account of experiments made with platinum disc electrodes immersed in a flame obtained by burning the gas from a large Bunsen burner at a row of holes in a quartz tube (quartz for insulation). It is shown that the conductivity of the flame is unaffected by putting salt on the electrodes, although the current is increased from $7{\cdot}3 \times 10^{-6}$ to 261×10^{-6} ampere, a result which enables the gradient to be determined from the current.

The value of the conductivity obtained and the number of ions per c.c. deduced from experiments by Prof. Wilson and the author (*Phil. Mag.*, April, 1906) enable an approximate value to be found for the velocity of the negative ions in an electric field. The velocity so obtained, 8000 cm. per second for an intensity of one volt per cm., was of a different order from those previously obtained (1000 cm. per sec.).

The latter had been found on the assumption that for small potential differences between platinum electrodes the gradient in the flame was uniform from electrode to electrode, the very close way in which Ohm's law was followed for small applied E.M.F.'s serving as a foundation for the assumption. The measurement of the gradient for applied E.M.F.'s of the order of one volt across 5 cm. is complicated by the variations in the potential taken up by a platinum wire in the flame, due to changes in the temperature and ionisation. These changes are large compared with the quantities to be measured, and ordinary methods of deducing corrections leave possible errors of the same order as the corrected quantity. To avoid this difficulty a special arrangement was adopted in which, by using a thermocouple as explorer, the actual variations due to the applied E.M.F.'s were separated from the incidental variations in the flame. It was found in this way that the fall of potential consisted of a rapid drop at the electrodes, at the negative electrode for the free flame, and at the positive when salt was vaporised beneath the kathode, together with a uniform gradient in the body of the flame.

The results so obtained gave the gradient necessary to drive the ions of salt vapour from the kathode to the anode while they travelled upwards with the stream of gas.

If v is the upward velocity of the flame gases, h the height of the electrodes, d the distance between them, and x the distance the salt vapour extends from the kathode, the velocity k_2 of the negative ions for unit electric field is given by $k_2 X/d-x=v/h$, where X is the gradient found as above. The velocity v of the flame gases was found by photographing the images of bright particles in the flame formed by reflection at a plane mirror attached to an electrically-driven tuning-fork.

The value found for the velocity of the negative ions for a gradient of one volt per cm. was found to be 12,900 cm. per sec.

The velocity of a corpuscle of mass m and charge e in an electric field of intensity X is $Xe\lambda/mu$, where λ is the mean free path and u the mean velocity of agitation of the corpuscles. Taking for e/m, λ, u, the values 10^7, 3×10^{-4}, $2{\cdot}32 \times 10^7$, respectively, we get for a field of one volt per cm. a value 13,000 cm. per sec. nearly, a result in close agreement with the value for the velocity of the ions found experimentally. It appears, therefore, that the negative ions in flames are free electrons, and not atoms or loaded corpuscles.

Interesting results, suggesting a field for further investigation, were found for the gradient when salt was vaporised beneath both electrodes.

January 24.—"On a New Iron Carbonyl and on the Action of Light and Heat on the Iron Carbonyls." By Sir James **Dewar**, F.R.S., and Dr. H. O. **Jones**.

The paper contains an account of the extension of the experiments, previously described, on the action of light on the liquid iron pentacarbonyl and on the action of heat on the resulting solid compound, diferrononacarbonyl. In the course of the experiments, new and interesting observations were made, and a new compound of iron and carbon monoxide discovered.

The action of light on iron pentacarbonyl alone or in solution results in the formation of $Fe_2(CO)_9$ and carbon monoxide, except in two cases, (1) when the solvent is nickel carbonyl, and (2) when the temperature is above 56° C.

The absence of any action due to light above 56° C. has been confirmed by using tubes fitted with a small manometer, which showed no change of pressure when no solid was deposited, and showed that the deposition of solid was a delicate test for any action.

At 35° C. solid was deposited, and pressure developed in five minutes in sunlight.

At 45° C. to 50° C. solid was deposited, and pressure developed in thirty minutes in sunlight.

At 56° C. *no* solid was deposited, and *no* pressure developed in five to twelve hours in sunlight.

The velocity of the reaction was measured, and it was found to be a reaction of the "first order." The rate of decomposition was compared with the rate of the reaction between ferric chloride and oxalic acid, which was investigated by Lemoine; it was found that iron carbonyl was slightly more sensitive to light than the mixture used by Lemoine.

The rate of the reverse action of carbon monoxide on the solid, which takes place in the dark, was also measured, and was found to be very small at the ordinary temperature, but to have a fairly normal temperature coefficient; the velocity was approximately trebled for an increase of 10° C.

Thus a reasonable explanation of the absence of any action of light above 56° C. can be suggested. If the direct action induced by light has a very small temperature coefficient, as the reaction investigated by Lemoine has, the reverse action being about 240 times as rapid at 56° C. as at 16° C. would easily prevent the accumulation of appreciable quantities of the products of the decomposition.

The action of heat on diferrononacarbonyl alone has been shown to produce a decomposition represented by the equation $2Fe_2(CO)_9 = 3Fe(CO)_5 + Fe + 3CO$. When the solid was heated in the presence of hydrocarbons, ether, bromobenzene, or iron pentacarbonyl, however, *green* solutions were obtained, iron pentacarbonyl was produced, but no gas was evolved; if alcohol, pyridine, acetone, or acetonitrile was the liquid used, *red* solutions were obtained, but no gas was evolved; with nickel carbonyl as solvent, gas was evolved and iron deposited. From the green solutions, under suitable conditions, lustrous green crystals were deposited; these were found to be a new compound, *iron tetracarbonyl*, $x\{Fe(CO)_4\}$, where x is large, probably about 20.

The new compound has a molecular volume of 84 for the unit $Fe(CO)_4$, and is very stable. It is not decomposed by hot concentrated hydrochloric acid, is attacked by hot concentrated sulphuric acid giving carbon monoxide and *ferrous sulphate*, and is readily decomposed by cold nitric acid.

Iron tetracarbonyl dissolves in hydrocarbons, ether, iron pentacarbonyl, nickel carbonyl, acetone, and acetonitrile to give green solutions which do not change on heating for a short time, and which deposit the green compound unchanged when evaporated out of contact with air; in pyridine and alcohol the compound dissolves to give a green solution, which changes slowly in the cold and rapidly on heating into a red solution.

The green solutions exhibit a characteristic absorption band in the yellow, while the red solutions show no selective absorption.

Chemical Society, February 21.—Prof. R. Meldola, F.R.S., president, in the chair.—The constitution of hydroxyazo-compounds: W. B. **Tuck**. Several of the hydroxyazo-compounds were examined spectrographically, and it was found that the absorption spectra of the *p*-hydroxy-compounds agree closely with those of their derivatives. The ethers of *o*-compounds also agree with the *p*-compounds, but the benzoyl derivatives are similar to benzoquinonebenzoylphenylhydrazone.—The influence of solvents on the rotation of optically active compounds, part ix., a new general method for studying intramolecular change: T. S. **Patterson** and A. **McMillan**.—Displacement of halogens by hydroxyl, i., the hydrolytic decomposition of hydrogen and sodium monochloroacetates by water and by alkali, and the influence of neutral salts on the reaction velocities: G. **Senter**. On the basis of the results obtained, the hypothesis put forward by R. J. Caldwell, that the accelerating influence of neutral salts on certain catalytic actions is due to the withdrawal of water and consequent concentration of the reacting substances, was criticised. It is considered that the effect in question is due to the action of the ions of the salt on H′ and OH′ ions.—The interaction of ammonium salts and the constituents of the soil: A. D. **Hall** and C. T. **Gimingham**.—The reduction products of *o*- and *p*-dimethoxybenzoin: J. C. **Irvine** and Miss A. M. **Moodie**.—Constituents of natural indigo, part ii.: A. G. **Perkin**. Numerous Java indigos have been found to contain kæmpferol. The leaves of *Indigofera sumatrana* contain a trace of what is probably kæmpferol.—The velocity of hydrolysis of aliphatic amides: J. C. **Crocker**.—The rates of reaction of formamide, acetamide, propionamide, butyramide, *iso*-butyramide, valeramide, capronamide with hydrochloric acid, have been determined at from 40° to 80°. The reactions are bimolecular, and the order of the relative reactivities is the same for each temperature. A relation between the reactivity of the amides at constant temperature and the strength of the corresponding organic acids was indicated.—The rusting of iron: W. R. **Dunstan**. In order to explain the fact that the rusting of iron can take place in the absence of carbonic acid, and that only iron, oxygen, and liquid water are necessary, the working hypothesis was suggested that the formation of hydrogen peroxide is concerned in the change, rusting being prevented by those substances which are capable of decomposing the peroxide (Trans. Chem. Soc., 1905, lxxxvii., 1548). The results of further experiments carried out by the author show that iron rusts freely in the absence of carbonic acid, provided that iron, oxygen, and liquid water are brought together.—Contributions to the chemistry of the rare earths, part ii.: M. **Esposito**. The methods of Muthmann and Böhm and Pattinson and Clarke for the preparation of ceria have been found to give a fairly pure product. Lanthana and old didymia can be separated by fractional crystallisation of the oxalates from strong nitric acid. Lanthana is best obtained by fractional crystallisation of the double ammonium nitrates. After one hundred and ten fractionations, lanthana, praseodymia, and neodymia were obtained in a state of considerable purity.—Derivatives of multivalent iodine, part iii., action of heat on iodobenzene dichloride and on the *m*- and *p*-nitro- and *p*-chloro-derivatives: W. **Caldwell** and E. A. **Werner**.—The organic phosphorus compound formed by yeast-juice from soluble phosphates. Preliminary notice: W. J. **Young**. A lead salt of the compound was prepared from the fermentation mixture by first removing any free phosphate by magnesium nitrate, and then adding lead nitrate. Analyses of two preparations, in which the carbon, hydrogen, lead, and phosphorus were determined, gave the empirical formula $C_3H_5O_6PPb$. From a solution of this the free acid can be obtained, which reduces Fehling's solution, gives Mohlisch's α-naphthol reaction, is slightly dextrorotatory, and can be titrated with alkalis.—Experiments on the synthesis of the terpenes, part x., synthesis of carvestrene and its derivatives: W. H. **Perkin,** jun., and G. **Tattersall.** Continuing their work on the synthesis of carvestrene, the authors have prepared *m*-cineol by the action of magnesium methyl iodide on ethyl *cyclo*-hexanone-3-carboxylic acid, and the *cis*- and *trans*- modifications of *m*-menthane-1 : 8-diol have also been obtained.

Zoological Society, February 19.—Sir Edmund G. Loder, Bart., vice-president, in the chair.—Remains of a bear from the superficial deposits of a cavern in the mountains of Corsica, where bears, though now extinct, were formerly numerous, at least up to the sixteenth century: Dr. C. I. Forsyth **Major.** Despite the fact that no truly fossil bears were as yet known from Corsica, Dr. Forsyth Major considered the Corsican bear to have been autochthonous, whilst in his opinion the recent mammals of Corsica (and Sardinia) had been, almost without exception, introduced by human agency. In any case, they could not be adduced as proofs of a recent connection of those islands with either of the neighbouring continents.—English domestic cats: R. I. **Pocock.** The author urged that the surest basis for their classification and the most satisfactory clue to their descent was furnished by the two distinct patterns found in so-called tabby cats. In one type the pattern consisted of narrow vertical stripes; in the other of longitudinal or obliquely longitudinal stripes which, on the sides of the body, tended to assume a spiral or subcircular arrangement characteristic of the "blotched" tabby. This distinction was long ago pointed out by Blyth. One or the other of these types was to be found in cats of almost all breeds, whether "Persian," "short-haired," or "Manx." There appeared to be no intermediate stages between the two. The cats of the "striped" type were no doubt descended from the European wild cat and the North African wild cat; but the origin of cats exhibiting the "blotched" pattern appeared to be unknown. It was to the cat of the latter kind that Linnæus gave the name *catus,* which was therefore no longer available for the European wild cat; this cat, therefore, must take the name *sylvestris.*—Report on the deaths that occurred among the mammals and birds in the society's menagerie during 1906: Dr. C. G. **Seligmann.** 356 Mammals and 283 birds were submitted to *post-mortem* examination, and the results showed that (1) tuberculosis occurring in birds in the gardens was usually due to infection by the gut; (2) the hearts of rheas, cassowaries, ostriches, and some of the larger storks kept in the gardens were often extremely flabby, and death in these birds was in a large number of cases due to cardiac failure; (3) new growths were rare both in mammals and in birds, but one case of carcinoma arising in the kidney, and occurring in a Chilian pintail (*Dafila spinicauda*), had been observed, as well as two instances of benign new growths occurring in birds not inmates of the gardens.—A peculiarly abnormal specimen of the turbot: J. T. **Cunningham.** The specimen was captured near Padstow, on the north coast of Cornwall. It was a young fish, measuring only 4·4 cm. in length, and a normal specimen of slightly smaller size, taken at the same time, was completely metamorphosed to the asymmetrical condition of the adult. In the abnormal specimen the right side was almost entirely destitute of colour, as in the normal condition, but both eyes were on this white side, instead of being on the left side, as in normal turbot. On the left side pigment was present over the whole surface except the head and the anterior part of the base of the dorsal fin, which were white. The fish was kept alive in captivity for two months, and was observed to lie always with its eyes uppermost, so that the upper side was white and the lower side coloured.—Ideas on the origin of flight: Dr. Baron F. **Nopcsa.** The author stated that from the mechanical point of view a patagium and a set of flight-feathers were different organs. He pointed out the osteological analogies between bats and pterosaurs, on the one hand, and between birds and dinosaurs on the other. He suggested that bats and pterosaurs had arisen from leaping, arboreal forms, whilst birds had come from a terrestrial, cursorial stock.—The azygos veins in the Mammalia: F. E. **Beddard.**

Royal Microscopical Society, February 20.—Lord Avebury, F.R.S., president, in the chair.—An early criticism of the Abbe theory: J. W. **Gordon.** This was a reply to a paper by Mr. Conrady with the same title, read before the society on October 17, 1906. At the conclusion of his paper Mr. Gordon exhibited on the screen some photographs of the spectrum produced by the fine ruling of an Abbe diffraction plate.—Some Tardigrada from the Sikkim Himalaya: James **Murray.**—Some Rhizopods from the Sikkim Himalaya: Dr. Eugène **Penard.**—An incident in ant life: Major **Sampson.** A thick living arch of travelling ants was seen by Major Sampson, now in Southern Nigeria, across a sunny road, and in the centre hundreds of pupæ being carried along in the shade thus caused. This is remarkable, because the African ant, as a rule, dislikes the sun.

Physical Society, February 22.—Prof. J. Perry, **F.R.S.,** president, in the chair.—Transformer indicator diagrams: Prof. T. R. **Lyle.** The term "transformer indicator diagram" has been applied by Prof. Fleming to any series of periodic curves which give the forms, relative phase positions, and magnitudes of the waves of current and E.M.F. on both the primary and secondary sides of a transformer when working. Such diagrams have been obtained by many investigators in different ways, but by none of the methods hitherto used has it been possible to determine directly and independently either the wave of magnetic flux F in the core, or the wave of magnetising-current turns usually represented by the vector sum $n_1C_1+n_2C_2$. It is shown in the paper that the integral $\int(n_1C_1+n_2C_2)dF$ for one cycle is equal to the total iron loss per cycle, and the advantage of being able to determine both $n_1C_1+n_2C_2$ and F directly and accurately is apparent. By means of the wave-tracer designed by the author, not only can the E.M.F. and current waves be accurately determined, but also the wave of magnetic flux pulsating in the core of the transformer, and in addition the magnetising current wave, $n_1C_1+n_2C_2$, can be obtained with the same accuracy as any of the other quantities.—Ionisation of gases by α particles of radium: Prof. **Bragg.** The present paper contains an account of further progress in the work of determining the relative amounts of ionisation produced by the α particle of RaC in different gases and vapours. The view is discussed that the ionisation (i) is connected with the expenditure of energy (e) of the α particle by the expression $\delta i/\delta\epsilon = kf(v)$, where k is a constant for each gas which may be termed the specific ionisation in terms of air as unity, the determination of which for various gases has been attempted in the present paper, and $f(v)$ is a function of the velocity of the α particle only. It is established that the total number of ions produced by the α particles of RaC varies with the nature of the gas, and is for most compound gases and vapours examined about one-third greater than for air. The conclusion is drawn that the primary action of the α particle is a subatomic one. The production of ions may be considered a secondary consequence which varies with the energy expended, the speed of the particle, and the nature of the molecule ionised. The stopping-power of a gas is more nearly an additive property of the atoms in the molecule than any other property except mass, and this is an effect quite apart from the proportionality of stopping-power to the square root of the atomic weight. For atomic weights below 30 the stopping-power, divided by the atomic square roots, is abnormally low, an effect curiously similar to the case of atomic heats. There does not appear any evidence that the chance of an atom being ionised is dependent upon whether it is already ionised, that is, occasionally the molecule may lose several ions.

Anthropological Institute, February 26.—Dr. A. C. Haddon, F.R.S., vice-president, in the chair.—Note on a dolmen called "La Pierre Turguaise," at Presles, France: A. L. **Lewis.** The monument consists of a chamber, with an entrance, formed by two small stones, which originally supported a third. The roof is formed of nine stones. The axis is between twenty and twenty-five degrees south of west and north of east. The total length is about 45 feet. The monument appears to have been sepulchral, but rites of some kind were also probably performed at it.—The ethnology of modern Egypt: Dr. C. S. **Myers.** The measurements, notes, and photographs taken in this investigation led to the conclusions (1) that, compared with the "prehistoric" people of 5000 B.C., the modern inhabitants show no sensible difference in head measurements or in the degree of scatter of individual measurements about their average; (2) that the modern Copts throughout Egypt are less negroid than the modern Moslem population; (3) that both the Copts and the Moslems in Upper Egypt are more negroid than those in Lower Egypt; (4) that from the anthropometric standpoint there is no evidence of plurality of race in modern Egypt.

Geological Society, February 27.—Sir Archibald Geikie, Sec.R.S., president, in the chair.—The Lower Ordovician succession in Scandinavia: W. G. **Fearnsides.** The paper is a stratigraphical account of the Dictyonema shales, the Ceratopyge beds, the Didymograptus shales, and the Orthoceras limestone of Sweden and southern Norway, and is based upon field-observations of Scandinavian type-localities made by the author during the summer of 1906. The beds are discussed under the following headings:—(*c*) Didymograptus shales and Orthocera*kalk*, (*b*) Glauconite shales and Ceratopyge*kalk*, (*a*) Dictyonema and Bryograptus shales, which are found to be applicable to all the sections visited. This stratigraphical evidence is considered in its bearing upon the question of the definition of the boundary between the Cambrian and the Ordovician systems, and the author follows the Scandinavian authorities in considering that, so long as the Dictyonema horizon is available, the evidence of sudden faunistic change within the series discussed is too slight to warrant a palæontological separation of the systems at any other horizon. A comparison of the British Tremadoc and Arenig series with these Scandinavian rocks concludes the paper, and it is maintained that the time has now arrived for British geologists to come into line with their Continental brethren, and to include the Dictyonema and the overlying Tremadoc beds as the lowest series of the Ordovician system.—The occurrence of pseudomorphous pebbles of pyrites at the Crown Reef Mine (Witwatersrand): C. B. **Horwood.** Reference is first made to the existence of calcite "pebbles" in the Main Reef, which Mr. Julius Kuntz believes to be due to the replacement of quartz by calcite. Pellets of iron-bisulphide, known as "buckshot," occur at the Rietfontein "A" Mine in the Buckshot Reef; they exhibit radiate fibrous structure, and are probably of concretionary origin. At the Crown Reef Mine a few "pebbles" of pyrites, some measuring as much as an inch in length, occur in a narrow band of conglomerate at the contact of the reef with a basic dyke.

DUBLIN.

Royal Dublin Society, February 19.—Prof. A. W. Conway in the chair.—Electrical seed-testing: Prof. T. **Johnson.** A demonstration was given of the method of using the apparatus devised by Dr. A. D. Waller, F.R.S., for testing for a "blaze" current in electrical seed-testing.—Series in spectra: Prof. A. W. **Conway.** A sphere of positive electricity is supposed, capable of executing radial elastic vibrations of low frequency. In any mode a negative electron could at certain periods be at rest for some time at any one of the nodal surfaces. The frequencies of the oscillations of an electron at the various nodes would be connected by an equation

$$a + bn^{-2} + Cn^{-4} \ldots,$$

where n is a natural number.

PARIS.

Academy of Sciences, March 4.—M. Henri Becquerel in the chair.—The heats of combustion and formation of some nitrogenous principles playing a physiological *rôle*: M. **Berthelot** and Ph. **Landrieu.** Thermochemical data for hæmatin, bilirubin, and hæmoglobin from the horse.—The phosphorescence of uranium salts in liquid air: Henri **Becquerel.** At the temperature of liquid air the bands observed in the spectrum at ordinary temperatures are partly resolved into lines, and the bands not resolved into lines contract and are more sharply defined. The phosphorescent spectrum is similarly modified.—The alcoholysis of castor oil: A. **Haller.** Castor oil was treated with various alcohols containing 1 per cent. of hydrochloric acid, and the esters obtained submitted to repeated fractional distillation in a vacuum. Methyl, ethyl, *n*-propyl, and isobutyl ricinoleates were obtained, the physical constants of which are given. The presence in the oil of the glycerides of stearic, ricinoleic, and dioxystearic acids was confirmed.—The purification of sewage: A. **Muntz** and E. **Lainé.** In previous work the authors have found that for intensive nitrification peat forms the best medium for the work. This result has now been applied to the purification of sewage. The filter-bed consists of spongy peat, to which chalk has been added in sufficient quantity to neutralise the acidity, together with a little garden mould to supply the necessary nitrifying organisms. After passing through two small septic tanks, the sewage is filtered through the peat-bed at the rate of 1 to 1·25 cubic metres per day per square metre of surface, and analytical data are appended showing the completeness of the purification.—The obliteration of the pleural cavity in the elephant: Alfred **Giard.** A continuation of the discussion raised by Mme. Phisalix.—Remarks on the preceding paper by M. Edmond **Perrier.**—The formulæ of addition of spherical functions: Niels **Nielsen.**—The constitution of the atom: H. **Pellat.** Starting with the present theory of the constitution of the atom as being formed of a centre positively charged around which gravitate negatively charged electrons, the calculation is made that for sodium, zinc, iron, and copper, the only light radiations possibly emitted by the vapours should be well in the ultra-violet. As this is not in accordance with the known facts, it is pointed out that some of the fundamental assumptions of the theory must be modified.—The refraction of bodies: Jules **Amar.**—Some new modes of formation and preparation of titanium tetrachloride: Em. **Vigouroux** and G. **Arrivaut.** Commercial ferrotitanium, from which the greater part of the iron has been removed by treatment with dilute hydrochloric acid, is dried and heated in a current of chlorine. A good yield of titanium tetrachloride is thus obtained, and details are given of the method of purifying it, especially from the accompanying ferric chloride.—The synthesis of tertiary amidines: phenyl-amido-ethane-oxymethane-phenylimino-phenylamine: Emm. **Pozzi-Escot.**—The constitution of hordenine: E. **Léger.**—A method of synthesis of non-substituted β-ketonic nitriles: Ch. **Moureu** and I. **Lazennec.**—A new method of estimating ammonia in waters: Albert **Buisson.** The method is based on the product of an insoluble compound by the addition of mercuric chloride and sodium carbonate.—The origin of the formation of aldehydes in cheese: MM. **Trillat** and **Sauton.** The bite in cheese has been shown to be largely due to the formation of aldehydes. In the present paper the best means of preventing aldehyde formation is studied.—The toxic power of the definite principles in *Tephrosia Vogelii*: M. **Hanriot.**—The colloidal properties of starch: E. **Fouard.**—The relations existing between the oxyhæmoglobin and the gases of the blood: MM. **Piettre** and **Vila.**—The influence of the physical nature of the walls on the increase of activity of the pancreatic secretion by calcium salts: C. **Delezenne.**—The structure of the cubical form of sodium chlorate possessing rotatory power: H. **Copaux.** The cubical crystals of sodium chlorate owe their rotatory power to the macles of a quasi-cubic orthorhombic form, slightly doubly refractive.—A contribution to the anatomical study of the Raphia of Madagascar: P. **Claverie.**—The edible fishes of Lake Mélah (Algeria): J. **Bounhiol.**—A new form of anidian evolution: Jan **Tur.**—The existence in the Sipunculidæ of Schizogregarians belonging to the family of the Selenidiideæ: L. **Brasil** and H. B. **Fantham.**—Reclamation of priority on the subject of a note by M. Maurice Dupont: Charles **Henry.**—The physiology of the hypophysis of the brain: C. **Paulesco.**—The intestinal absorption, the formation, and the utilisation of reserves in rotifers: P. **de Beauchamp.**—The function of the intestine in fibrinogensis: M. **Doyon,** Cl. **Gautier,** and A. **Morel.**—The lava and minerals of the volcanoes of the Puys chain; the age and cause of the eruptions: Ph. **Glangeaud.**—The graphitic schists and quartzites of Berric, and on their relations with those of Morbihan, of Sarzeau-Guérande, and Belle-Ile: M. **Pussenot.**—The cañons of Provence and the irregularities in the curves of equilibrium of underground water: E. A. **Martel.**—The diminution in the intensity of the earth's magnetic field as a function of the altitude in the *massif* of Mont Blanc: A. **Senouque.**

New South Wales.

Royal Society, December 5, 1906.—Prof. T. P. Anderson Stuart, president, in the chair.—Bibliography of Australian, New Zealand, and South Sea Island lichens (second paper): E. **Cheel.**—(1) Analysis of a specimen of sea-water from Coogee: (2) analysis of the ash of a New South Wales seaweed (Ecklonia); (3) analysis of Roman glass from Silchester, with special reference to the amount of manganese and iron present: C. J. **White.**—Analyses of chocolate shale and of tufaceous sandstone, from the Narrabeen series: S. G. **Walton.** In these analyses special attention was paid to the determination of smaller pieces of the rarer elements.—Gold nuggets from New Guinea, showing a concentric structure: Prof. **Liversidge.** These nuggets presented the usual external appearance, but when sliced, polished, and etched with aqua regia, they showed in parts a concentric structure, but no macrocrystalline structure. Out of a very large number of gold nuggets examined for several years past, these two are the only ones which have shown a lamellar structure. Apparently the layers of gold were deposited within a cavity, in the same way as agates are built up by the deposition of layers of quartz and chalcedony. The evidence is against the successive layers having been deposited around a central nucleus. The gold in one was 88·95 per cent. and silver 1 per cent., and the other 88·25 per cent. and silver 1·05 per cent.—The rate of decay of the excited radioactivity from the atmosphere in Sydney: S. G. **Lusby** and T. **Ewing.** The rate of decay of the excited radio-activity in Sydney is found to be practically the same as that obtained by Rutherford and Allan for Montreal (*Phil. Mag.*, 1902) and by Bumstead in New Haven (*Am. Journ. Sci.*, 1904).

DIARY OF SOCIETIES.

THURSDAY, March 14.

Royal Society, at 4.30.—On the Gravitational Stability of the Earth: Prof. A. E. H. Love, F.R.S.—The Total Ionisation of Various Gases by the α-Rays of Uranium: T. H. Laby.—On the Ionisation of Various Gases by the α-, β- and γ-Rays: R. D. Kleeman.—Capillary Electrometer Records of the Electrical Changes during the Natural Beat of the Frog's Heart: Prof. F. Gotch, F.R.S.

Royal Institution, at 3.—Biology and Progress: Dr. C. W. Saleeby.

Society of Arts, at 4.30.—The City of Madras: Sir James Thomson.

Mathematical Society, at 5.30.—Exhibition of a New Calculating Machine: G. W. Evans-Cross.—On the Reduction of the Factorisation of Binary Septans and Octans to the Solution of Indeterminate Equations of the Second Degree: Dr. T. Stuart.—Invariants of the General Quadratic Form *Modulo* 2: Prof. L. E. Dickson.—On Partial Differential Equations of the First Order: J. Brill.

Institution of Electrical Engineers, at 8.—*Adjourned discussion:* The Transmission of Electrical Energy by Direct Current on the Series System: J. S. Highfield.

FRIDAY, March 15.

Royal Institution, at 9.—Problems of Applied Chemistry: Prof. G. Lunge.

Institution of Mechanical Engineers, at 8.—Petrol Motor-Omnibuses: W. Worby Beaumont.

SATURDAY, March 16.

Royal Institution, at 3.—Röntgen, Kathode, and Positive Rays: Prof. J. J. Thomson, F.R.S.

MONDAY, March 18.

Victoria Institute, at 4.30.—Survivals of Primitive Religion amongst the People of Asia Minor: Rev. G. E. White.

TUESDAY March 19.

Royal Institution, at 3.—The Visual Apparatus of Man and Animals: Prof. William Stirling.

Institution of Civil Engineers, at 8.—The Victoria Falls Bridge: G. A. Hobson.

Royal Statistical Society, at 5.

Society of Arts, at 8.—Oils, Varnishes, and Mediums used in the Painting of Pictures: A. P. Laurie.

Zoological Society, at 8.30.

Mineralogical Society, at 8.—On the Minerals of the Silvermines District, co. Tipperary: A. Russell.—On Baddeleyite from Ceylon: G. S. Blake and Dr. G. F. Herbert Smith.—On the Silver Deposit in the Perran Mine, Perranuthnoe, Cornwall: F. H. Butler.—Zinciferous Tennantite from the Binnenthal: Dr. G. T. Prior and R. H. Solly.

Faraday Society, at 8.—The Potential of Hydrogen liberated from Metallic Surfaces: H. Nutton and H. D. Law.—Electrode Potentials in Liquid Ammonia: F. M. G. Johnson and N. T. M. Wilsmore.—The Impedance of Solutes in Solvents as manifested by Osmotic "Pressure": J. G. A. Rhodin.—The Electrolytic Deposition of Zinc, using Rotating Electrodes, ii.: Dr. T. Slater Price.

WEDNESDAY, March 20.

Society of Arts, at 8.—Smoke Prevention in Factories and Electric Supply Stations: J. B. C. Kershaw.

Entomological Society, at 8.—The Vinegar Fly (*Drosophila funebris*): E. E. Unwin.—The Structure and Life-history of the Holly Fly: Prof L. C. Miall, F.R.S., and T. H. Taylor.

Royal Meteorological Society, at 7.30.—The Exploration of the Air: Major B. F. S. Baden-Powell.

Royal Microscopical Society, at 8.—Some South African Tardigrada: James Murray.—*Exhibition:* Specimens of British Mycetozoa: A. E. Hilton.

THURSDAY, March 21.

Royal Institution, at 3.—Biology and Progress: Dr. C. W. Saleeby.

Chemical Society, at 8.30.—The Synthesis of Polypeptides: Emil Fischer.—Organic Derivatives of Silicon, Part iii., *dl*-Benzylmethylethylpropylsilicane and Experiments on the Resolution of its Sulphonic Derivative: F. S. Kipping.—On the Reduction of Carbon Dioxide to form Aldehyde in Aqueous Solutions: H. J. H. Fenton.—The Mechanism of the Rusting of Iron: G. T. Moody.—Some Compounds of Guanidine with Sugars, Part i., R. S. Morrell and A. E. Bellars.

Linnean Society, at 8.—On the Origin of Angiosperms: E. A. Newell Arber and John Parkin.—*Exhibitions:* Water-colour Sketches of Alpine Flowers: Miss Helen Ward.—Photographs of Transvaal Trees and Tree Scenery: J. Burtt Davy.

Institution of Electrical Engineers, at 8.——Rail Corrugation: J. A. Panton.

FRIDAY, March 22.

Royal Institution, at 9.—Rays of Positive Electricity: Prof. J. J. Thomson, F.R.S.

Physical Society, at 5.—Experimental Mathematics: Mr. Pochin.—Logarithmic Lazytongs and Lattice Works: Mr. Blakesley.—A Micromanometer: Mr. Roberts.—Electrical Conduction produced by heating Salts: Mr. Garrett.

Institution of Civil Engineers, at 8.—A Point in Turbo-Alternator Design: F. J. Kean.

SATURDAY, March 23.

Royal Institution, at 3.—Röntgen, Kathode, and Positive Rays: Prof. J. J. Thomson, F.R.S.

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